

UNPUBLISHED  
SURVEY & CONTROL  
REPORTS

INTERMOUNTAIN STATION  
Central Reference File

No. 3.4163-31

UNITED STATES  
AGRICULTURE  
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE  
DIVISION OF FOREST INSECT INVESTIGATIONS

RECEIVED  
JAN 19 1952

Boeur d'Alene, Ida.  
Laboratory

(NOT FOR PUBLICATION--FOR ADMINISTRATIVE USE ONLY)

ENGELMANN SPRUCE BEETLE CONDITIONS  
ROUTT, ARAPAHO, and WHITE RIVER NATIONAL FORESTS, COLORADO  
1952

File # 2-3  
Jackson 2/12  
Terrell  
Greath  
Hogden  
Hosden

by

Fred B. Knight

and

W. F. McCambridge

Forest Insect Laboratory  
233 Forestry Bldg., Colo. A & M  
Fort Collins, Colorado  
December 18, 1952

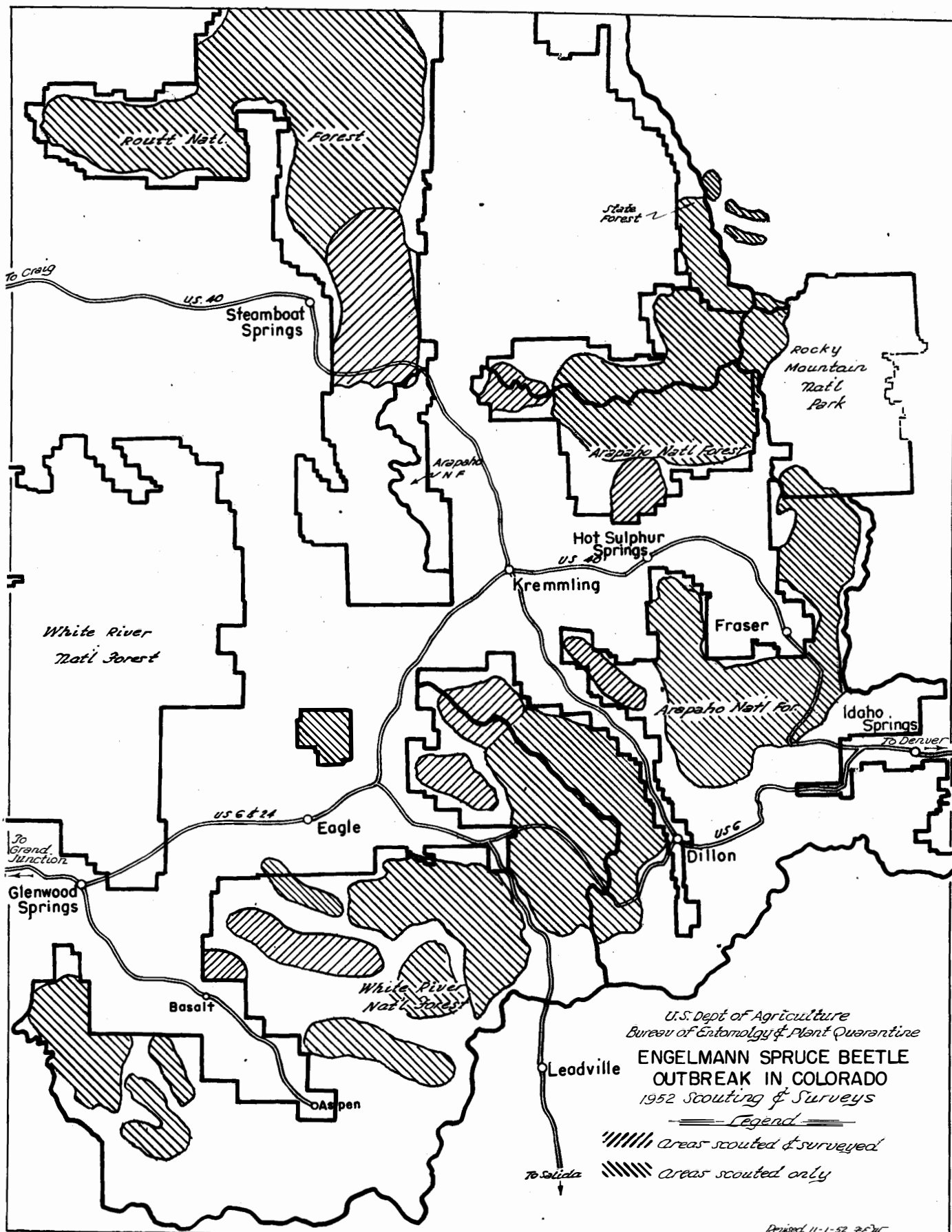
This report is not for publication in whole or in part without  
prior approval by the Chief of this Bureau.

FILE COPY

MISSOURI  
FOREST INSECT  
LABORATORY

# Table of Contents

	<u>Page</u>
MAP OF 1952 SURVEY COVERAGE	
INTRODUCTION . . . . .	1
Previous Outbreaks . . . . .	1
History of Present Outbreak . . . . .	1
The Control Program -- 1950 and 1951 . . . . .	3
Table 1 . . . . .	3
THE 1952 CONTROL PROGRAM . . . . .	4
Early Planning . . . . .	4
The Training Period . . . . .	4
Treating Program . . . . .	4
Table 2 . . . . .	5
Trap Trees . . . . .	5
THE 1952 SURVEYS . . . . .	5
The Survey in General . . . . .	5
Table 3 . . . . .	6
Survey Personnel . . . . .	7
Table 4 . . . . .	7
KREMLING CONTROL AREA . . . . .	8
Summary . . . . .	8
Table 5 . . . . .	9
Descriptions of Infestation by Blocks . . . . .	9
Block 1--Elk Mountain . . . . .	9
Block 2--Williams Ridge . . . . .	9
Block 3--Sheephorn-Elliott Creek . . . . .	10
Block 4--Chimney Rock . . . . .	10
Block 5--Rabbit Ears . . . . .	10
Table 6 . . . . .	10
Block 6--Surprise Lake . . . . .	11
Block 7--Meadow Creek . . . . .	11
Scouting . . . . .	11
EAGLE CONTROL AREA . . . . .	12
Summary . . . . .	12
Table 7 . . . . .	12
Descriptions of the Infestation by Blocks . . . . .	13
Block 8--Red and White Mountain . . . . .	13
Block 9--Red Table Mountain . . . . .	13
Table 8 . . . . .	13
Block 10--Basalt Mountain . . . . .	14
Scouting . . . . .	14
SUMMARY . . . . .	15
REFERENCES . . . . .	16



## ENGELMANN SPRUCE BEETLE CONDITIONS

### ROUTT, ARAPAHO, and WHITE RIVER NATIONAL FORESTS

Colorado 1952

#### Appraisal Survey

#### Introduction

#### Previous Outbreaks

Destruction of spruce forests by the Engelmann spruce beetle, Dendroctonus engelmanni Hopk., is not new in the Rocky Mountains. "One of the earliest notes about this insect is by Packard (1877) to the effect that in his surveys of 1875 the beetle was very common in Colorado and was especially common near Blackhawk and Manitou, Colorado. Several years prior to 1907, 75 to 90 percent of the spruce was killed in the Sierra Blanca Mountains of the Lincoln National Forest in New Mexico (Hopkins 1908). In 1905, Hopkins (1906) found evidence of an epidemic that occurred about 50 years prior to that date on the Pike National Forest, particularly on the south slopes of Pike's Peak. A fire followed the epidemic leading the casual observer to believe that the fire was the primary cause of the destruction rather than the beetle. Much destructive work was reported on the Manti National Forest in Utah in 1905 (Hopkins 1906). The beetle was particularly active on the White River National Forest about 20 years prior to 1906 (Hopkins 1906), where it was estimated that 20 percent of the mature spruce was killed in the area between East Elk Creek and Deep Lake. An examination of the infestation on the Grand Mesa in August 1943 showed that a severe epidemic swept the Grand Mesa proper about 75 years ago. The forest floor was covered with old trees with evidence of the beetle galleries on the surface. One of the more recent epidemics occurred about 20 years ago on Boulder Mountain on the Powell National Forest in Southern Utah. The spruce type, limited to about 10 sections and isolated on this mountain top, was completely denuded of merchantable-sized trees. A severe fire followed the epidemic. A severe infestation swept through the northwest portion of Yellowstone National Park from 1933 to 1937, killing 90 percent of the spruce above 10 inches d. b. h. in certain areas."

#### History of the Present Outbreak

All known previous outbreaks were small in comparison to the present one which started in 1939. In the short span of years between 1939 and 1952 this outbreak has caused a loss of 4.3 billion board feet of timber. The present outbreak started in spruce blown down in June 1939 on the White River and Grand Mesa National Forests. Beetle populations which developed in the blow-down material began attacking standing spruce in 1941. However, it was not until 1943 that widespread destruction became alarming, not only on the White River and Grand Mesa Forests, but also on the Gunnison, Uncompahgre, and San Juan National Forests. By the fall of 1943, the spruce timber loss on the White River National Forest had reached 864,300,000 board feet. During this same year the outbreak reached its peak on the

Gunnison National Forest with the loss of 1,500,000 board feet of spruce, and died down thereafter. During 1943, infestations were active on the Grand Mesa, Uncompahgre, and San Juan Forests.

In 1944 the outbreak on the Uncompahgre reached its peak and died out shortly thereafter with a loss of 3,000,000 board feet of spruce. Sanitation logging practices were largely responsible for bringing this part of the outbreak under control. Losses on the Grand Mesa had reached 18,000,000 board feet of spruce, and the San Juan was suffering very heavy losses. The White River Forest lost 919,300,000 board feet of spruce in 1944, bringing the total loss to 1,783,650,000 board feet. Also in 1944, heavy losses (7,600,000 board feet) were noticed on the Routt National Forest. This was the first indication that the outbreak was moving in a northeasterly direction.

By the end of 1945, the outbreak on the San Juan had reached its peak with an estimated loss of 50,000,000 board feet of spruce. In 1946 most of the merchantable spruce on the White River National Forest north of the Colorado River had been killed—2,342,000,000 board feet. The outbreak was now moving to the north and east along the Routt and Arapaho Forests, and subsiding on the Forests south of the White River National Forest.

In 1947 the outbreak had reached its peak on the Grand Mesa with a total loss of approximately 80,000,000 board feet of spruce. Sanitation logging aided considerably in bringing this outbreak under control. During this same year it was noticed that lodgepole pine, which had been resisting attacks by the Engelmann spruce beetle, was being killed as a result of attacks by adults entering the basal portion of these trees for hibernation.

By 1948 most of the merchantable spruce on the White River National Forest north of the Colorado River had been killed. This loss amounted to nearly 3,000,000,000 board feet. In addition, many millions of board feet of lodgepole pine were killed. The outbreak was situated on the Routt and Arapaho Forests south of Rabbit Ears Pass and north of the Colorado River. Only on Castle Peak and Cottonwood Peak had epidemic numbers of beetles crossed to the south of the river. Spruce volume losses on the Routt National Forest had reached approximately 100,000,000 board feet; losses on the Arapaho were still under 50,000,000 board feet.

The general northeasterly movement of the outbreak stopped in 1949 when strong winds out of the northwest pushed the attacking beetles far south of the Colorado River. The 1949 beetle flight extended the outbreak into areas hitherto relatively free of beetle infestations. With the completion of this flight, timber losses reached 100,000,000 board feet of spruce and 10,000,000 board feet of lodgepole pine on the Arapaho, 3,065,000,000 board feet of spruce and 370,000,000 board feet of lodgepole pine on the White River, and 300,000,000 board feet of spruce and 20,000,000 board feet of lodgepole pine on the Routt National Forest. It is estimated that spruce volume losses in 1950 on the three Forests amounted to 220,000,000 board feet, and an additional 20,000,000 feet were killed in 1951. Lodgepole pine losses during the two-year period amounted to 100,000,000 board feet, confined chiefly to the White River and Routt National Forests. The above itemized losses amount to 3,839,500,000 board feet of spruce and 500,000,000 board feet of lodgepole pine, or a total loss of both species on all Forests since 1939 of slightly over 4.3 billion board feet.

The number of board feet killed in 1952 was very small compared to previous years due to the declining outbreak. This loss does not affect the rounded loss figure of 4.3 billion board feet during the outbreak.

### The Control Program--1950 and 1951

After considering the epidemic from all approaches, it was decided that spruce beetle control would be feasible. In the fall of 1949 a pilot operation was set up on Basalt Mountain to test treating methods and to obtain operational "know how". This successful operation led to the big year as far as control was concerned. In 1950, 784,082 spruce trees were treated. The estimate for continued control work in 1951 was enormous, 1,546,600 trees.

Luck was with the program because during the winter of 1950-51 a severe cold wave hit Colorado. Temperatures lethal to spruce beetles above the snow line were recorded throughout the outbreak area. Subsequent surveys during the winter showed that an average beetle mortality of approximately 87 percent had occurred in the infested trees. Also, by this time the woodpecker population had increased tremendously. The beetle mortality in the upper boles forced the woodpeckers to feed in the lower part of the stems as the snow receded. This timely cold wave in combination with the increased woodpecker population permitted a much reduced control program in 1951. Spring surveys were made and many areas were eliminated from the need of treatment. Consequently, the delayed control program in 1951 was very successful in combating the beetle population where winter mortality had been variable or low; 199,002 trees were treated with insecticide.

TABLE 1.--Summary of spruce beetle control in 1950 and 1951

Block	Trees Treated 1950	Estimate of Trees to Treat in 1951	Trees Treated 1951
Sherman Creek	418	-----	*
Bill Creek	2,167	-----	*
Parkview Mtn.	797	-----	*
Chimney Rock	26,462	15,000	**
Willow Creek	13,944	2,000	**
Elk Mtn.	10,772	14,000	**
Fool Creek	296	470	**
Cottonwood Peak	168,642	252,000	93,743
Elliot Creek	32,583	46,000	**
Williams Ridge	31,552	33,000	**
Red & White Mtn.	89,224	137,000	22,629
Red Sandstone & Spraddle Creek	4,420	-----	*
Hardscrabble Mtn.	206,213	98,700	75,174
Red Table Mtn.	58,831	476,000	1,916
Basalt Mtn.	25,592	18,000	**
West Lake	2,093	4,600	**
Castle Peak	110,076	164,000	**
U. S. 40 to Lux Lake		205,000	5,540
Total	784,082	1,465,770	199,002

1/ Survey data within the major infested areas.

\* indicates that infestations no longer existed. \*\* indicates that winter mortality was sufficient to reduce the outbreak to a level where artificial control was not deemed necessary.

## The 1952 Control Program

### Early Planning

The 1951 fall survey indicated that an estimated 400,000 beetle-infested trees would need to be treated in 1952. This figure was very sound; however, it was realized and expected that increased woodpecker activity and increasing parasitism would reduce the figure. Therefore, it was necessary to make an intensive early survey so that trees, possibly whole areas of trees, would not be treated unnecessarily. In March 1952 a winter survey was made by "Sno-Cat". Woodpeckers were found to be very active everywhere and in some areas they already had devoured the beetle populations from many trees which had been counted as treatable the previous fall.

The Bureau of Entomology and Plant Quarantine survey crews worked directly with Forest Service supervisory personnel and treating crews in delineating all areas to be treated during the season. Intensive surveys showed the areas needing treatment, those where no treating was needed, and doubtful areas. Decisions on treatment in the latter areas were withheld until late surveys were completed. This system worked well since natural control factors had more time to be effective with the consequent elimination of many doubtful areas from the need of treatment.

### The Training Period

On June 9, 1952 Forest Service project, area, and camp overhead personnel and Bureau of Entomology and Plant Quarantine survey personnel and camp entomologists were brought together at the Sheephorn-East Camp for one week of intensive field training. This cooperative and combined training was very successful and all personnel left the camp for their assigned duties with a common knowledge of all angles of the survey and control program. A season of the very highest caliber work resulted.

### Treating Program

Early in the season's operation only 1950- and 1951-attacked trees were treated. After August 1, and even previous to that date where it was deemed advisable, 1952-attacked trees also were treated. A continuous delineation of treating areas was carried on throughout the season and all areas of 1950- and 1951-attacked trees and all areas of 1952-attacked trees in need of control were treated before the close of operations. A highly efficient program was carried on throughout the season with a minimum of unnecessary work and a maximum of accomplishment. It had been expected that control would continue into September, but early in August many areas previously classed as treatable or doubtful were eliminated from the need of control. This was done primarily because of the tremendous increase of spruce beetle parasitism in those areas. Treating for beetle control ceased on August 22.

TABLE 2.--Summary of control in 1952

Treating Camp	1950's & 1951's	1952's	Total Treated	Acres
<b>A. Krumming Area:</b>				
Sheephorn East	22,166	1,336	23,502	3,035
Rabbit Ears	16,925	1,981	18,906	2,704
Buffalo Pass	4,256	399	4,655	970
Sum:	43,347	3,716	47,063	6,709
<b>B. Eagle Area:</b>				
Piney	48,655	5,899	54,554	1,016
Red Creek	3,873	1,928	5,801	130
Corral	22,976	19,911	42,887	1,193
West Red Table	53,010	24,334	77,344	1,050
Gore Creek	185	20	205	390
Sum:	128,699	52,092	180,791	3,395
Grand Sum	172,046	55,808	227,854	10,104

### Trap Trees

In the fall of 1951 trap trees were cut in several areas. Use of trap trees was based on studies made by Massey in 1949 and was designed to function in areas of doubtful direct control need and to further the knowledge of trap-tree effectiveness. The trap trees were very successful in attracting beetles which might have attacked many standing green trees. The trap trees later were treated or removed as a part of the control program. It is planned to use additional trap trees in the final mop-up phase of the program.

### The 1952 Surveys

#### The Survey in General

The field survey of 1952-attacked spruce began in mid-July and terminated September 12. This survey was divided into two phases, scouting and surveying. Scouting was done in areas where epidemics may but were not known to exist, the objective being to locate those that did exist. Surveying was done in areas where epidemics were known to have existed in 1951, or in areas where scouting parties had located epidemics. The objectives of surveying were to estimate the average number of infested trees per acre for any designated area, determine accurately the size of each infested area, compute a reliable estimate of the total number of trees to be treated within limits of economical feasibility, and map the concentrations of infested trees.

The surveys were carried on as part of the plan to treat all epidemic areas during the 1952 treating season. Areas where epidemics were believed to be greatest were surveyed first and the results were immediately given to Forest Service's control project supervisory personnel. When the control operations were terminated, all of the treatable areas had been cared for.



No known epidemic areas remained at the end of the season; some areas with scattered infested trees will have to be re-scouted during 1953 and it is possible that trap trees will need to be felled before the 1954 beetle flight. Some scattered 1951-attacks remain. From those trees small areas of 1953-attacks may occur; there may be need for some treating after the flight in August 1953; and probably some trap trees and trees felled for road locations in 1952 will have to be treated after August 1953.

Scouting was essentially a task of examining susceptible stands of spruce, counting and plotting all infested trees on the scouting lines, and determining from the collected data whether or not epidemic areas existed. If an epidemic area exceeded 10 acres in size, it was to be surveyed. The 1952 scouting revealed no new epidemic areas. Except for a few small "blow-down" and snow-slide groups of spruce, very few infested trees were found during scouting.

Surveying was the collection of data from 1/10-acre circular plots established on parallel lines across the epidemic area, unless the area was of 10 acres or less in size. The intensity of survey coverage during 1952 was as shown in Table 3.

TABLE 3.—Intensity of survey coverage

Size of Area in Acres	Percent Survey	Distance Between Plots in Chains	Distance Between Lines in Chains
1 to 10	100.00		
10 to 500	5.00	2	10
500 +	2.50	2 or 4	20 or 10

No areas were surveyed at an intensity of less than 2.50 percent.

The data recorded for each 1/10-acre plot was:

1. Number of 1952 full-attacked trees
2. Number of 1952 partial-attacked trees
3. Timber type
4. Degree of woodpecker feeding during past years
5. Remarks concerning development and severity of the beetle attacks
6. The number of green spruce left on the plot (taken on every fifth plot)
7. General remarks on topography, such as streams, fences, roads, and trails

The following definitions of attack were used:

1. "Full Attack"—Tree infested for over 50 percent of its circumference by 1952-attacking beetles.
2. "Partial Attack"—Tree infested in less than 50 percent of its circumference by 1952-attacking beetles.

The field survey covered approximately 2.4 million gross acres of land about one-third of which was spruce type. The results of the field survey, by blocks, are explained in this report after the listing of survey personnel.

## Survey Personnel

For the 1952 Engelmann spruce beetle control program in Colorado a very simple but effective survey organization was maintained. Overall responsibility for surveys and the entomological assistance to the Forest Service were charged to B. H. Wilford of the Fort Collins, Colorado, Field Laboratory, Division of Forest Insect Investigations, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, assisted by W. F. McCambridge and Fred B. Knight, in charge, respectively, of all survey and camp entomologist activities in the Eagle and the Kremmling control areas.

TABLE 4.--Entomological personnel on the Engelmann spruce beetle control project, 1952, Fort Collins, Colorado, Field Laboratory, Division of Forest Insect Investigations, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture

Name	Position
B. H. Wilford <sup>1/</sup>	Entomologist in Charge, Project
W. F. McCambridge <sup>1/</sup>	In Charge, Eagle Area
F. B. Knight <sup>1/</sup>	In Charge, Kremmling Area
F. T. Hutchison <sup>2/</sup>	Survey Assistant, Eagle Area
C. J. Hay	Survey Assistant, Kremmling Area
R. L. Barger	Chief of Survey Party
D. J. Boyd	" " " "
P. L. Daniell	" " " "
W. L. Mchenberger	" " " "
R. A. Hatcher	" " " "
J. D. Houston	" " " "
W. D. Ray	" " " "
R. E. Reichle	" " " "
R. F. Preator	" " " "
D. C. Phillips	" " " "
C. D. Dybing	" " " "
R. K. Bennett	Camp Entomologist
D. (nm) McComb	" "
P. M. Webb	" "
E. H. Wemple	" "
F. M. Yasinski	" "
G. F. Wilson	" "
D. A. Barnett	Survey Crew Member
J. C. Cruse	" " "
G. I. Day	" " "
R. O. Dull	" " "
I. E. Lindauer	" " "
J. A. E. Knopf	" " "
D. D. Lucht	" " "
R. L. Nelson	" " "
L. Nichols, Jr.	" " "
R. L. Peterson	" " "
D. E. Sbur	" " "
J. E. Stark	" " "
W. E. Taylor	" " "
T. H. Houghton	" " "

Table 4.---(Continued)---Employees on the Engelmann spruce beetle control project, 1952

Name	Position		
F. T. Gauthier	Survey Crew Member		
D. W. Sass	"	"	"
H. C. Zeutzius	"	"	"
J. M. Rockman	"	"	"
P. C. Hamilton	"	"	"
J. M. Jewett	"	"	"
D. E. Kelly	"	"	"
P. Brock	"	"	"
G. E. Janssen	"	"	"
A. G. Schienbein	"	"	"
R. R. Olmsted	"	"	"
E. G. Lucas	"	"	"
W. R. Finley	"	"	"
W. P. Clark	"	"	"
T. E. Lewis	"	"	"
G. G. Morris	"	"	"
E. J. Widmer	"	"	"

- 1/ Permanent employees, U. S. Department of Agriculture, Bureau of Entomology and Plant Quarantine, Forest Insect Laboratory, Fort Collins, Colorado.
- 2/ Forest Entomologist, Colorado State Forester's Office, Denver, Colorado.

The excellent work done by all seasonal employees as a team and as cooperators with the U. S. Forest Service is appreciated by the permanent members of the forest insect laboratory. The constant and determined assistance given by F. T. Hutchison and C. J. Hay was invaluable in the training of personnel and in directing the field crews.

#### Kremmling Control Area

##### Summary

The Engelmann spruce beetle outbreak on the Kremmling control area has been greatly reduced in extent since 1951. Three factors are primarily responsible: (a) the Forest Service's control program of 1950, 1951, and 1952, (b) the tremendous buildup of woodpecker and parasite populations, and (c) the cold wave of 1950-51. Lacking any one of the three factors, the number of 1952-attacks would have been much greater. All of the 1950 epidemic areas were surveyed during 1952 and the surrounding spruce type on the Routt and Arapaho National Forests were scouted. In addition, some spruce type was examined in the Rocky Mountain National Park, the Colorado State Forest, and the Roosevelt National Forest. Many of the smaller epidemic groups surveyed in 1951 had been controlled by natural factors. No blocks with epidemic concentrations of 1952-attacks were found. However, a few blocks with scattered attacks were observed. These must be scouted in 1953; some may require control if the 1953 flight results in more attacks. Trap trees in one or two blocks may be needed next fall.

The 1952 survey results are summarized in Table 5.

TABLE 5.—Kremmling Area—Summary of survey on blocks not treated in 1952.  
(In treating blocks all 1952-attacked trees were treated along with 1951-attacked trees).

Block	Gross Acreage Surveyed	Full Attacks Per Acre	Partial Attacks Per Acre	Total Attacks Per Acre	Percent Survey
Elk Mountain	3022	0.013	0.	0.013	2.59
Williams Ridge	1880	0.063	0.042	0.105	2.54
Sheephorn-Elliot <sup>1/</sup>	4979	0.438	0.067	0.506	2.38
Chimney Rock	5388	0.007	0.029	0.037	2.50
Rabbit Ears <sup>2/</sup>	12942	0.207	0.161	0.368	2.39

<sup>1/</sup> In previous years this was two blocks, Cottonwood Peak and Elliot Creek. Because of the great reduction in acreage and their proximity, the two were combined.

<sup>2/</sup> Includes some spruce type south of U. S. 40 and all spruce type north to Horsethief Peak.

During 1952 it was necessary to treat only about 44,000 of the 100,000 1951-attacks estimated in the fall of 1951, a result of the increased woodpeckering and parasitism during the winter and summer of 1951-1952.

#### Descriptions of the Infestation by Blocks

##### Block 1—Elk Mountain

A 2.59-percent survey was made on 3,022 acres of spruce type on Elk Mountain. The 1951-attacks were found to be heavily woodpeckered and mostly dried out. Only one 1952-attack was found in the entire survey. Scouting of the surrounding area revealed that the entire infestation was at a very low endemic level.

No areas on Elk Mountain need particular attention during 1953 except for general scouting after the 1953 flight is completed.

##### Block 2—Williams Ridge

A 2.54-percent survey was made on 1,880 acres of spruce type on Williams Ridge. Trap trees were used on Williams Ridge in 1952. These attracted 1952-attacks but were not counted in the survey because they have been treated. Only three full attacks and two partial attacks were tallied on the entire survey. Scouting on many more acres of adjoining type produced no tally. The five attacks were found near the head of Lost Creek. Since all 1951-attacked trees were heavily woodpeckered, it is expected that the small group near Lost Creek will be eliminated similarly by the end of another year. However, the Lost Creek area should be scouted after the flight in 1953. Other than that, a general coverage of Williams Ridge will be sufficient in 1953. It is not expected that treating or trap trees will be needed in 1953.

### Block 3--Sheephorn-Elliot Creek

A 2.38-percent survey was made on 4,979 acres of spruce type on the Sheephorn-Elliot Creek block. Many more acres not surveyed were treated during 1952, especially on the Elliot Creek area. Most of the Sheephorn area was treated prior to the time of 1952-attacks; no areas warranting treatment were found after the 1952 beetle flight.

A total of 52 full attacks and eight partial attacks was found on the cruise, mostly in the Sheephorn area. The number of attacks per acre was low overall and most attacks were in small trees close to Beaver Dam Lake. A few were found in the Sheephorn Basin area. It is expected that woodpeckers and parasites will eliminate the beetles from the trees found. These areas should be checked carefully after the 1953 flight and possibly some treating or use of trap trees may be needed if the number of 1953-attacks warrant.

### Block 4--Chimney Rock

A 2.50-percent survey was made on 5,388 acres of spruce type on the Chimney Rock block. One full attack and four partial attacks were tallied during the survey. Scouting of the surrounding area revealed that the entire block is at a low endemic rate of infestation.

No areas on Chimney Rock need particular attention during 1953 except for general scouting after the 1953 flight. No treating or trap trees will be needed. 1951-attacked trees were almost as scarce as the 1952-attacked trees.

### Block 5--Rabbit Ears

A 2.39-percent survey was made on 12,942 acres of spruce type in the Rabbit Ears block. Since the block covers such a wide area of scattered timber, a breakdown of the acreage surveyed, Table 6, is informative.

TABLE 6.—Areas surveyed in Rabbit Ears Block—1952

<u>Area</u>	<u>Acreage</u>
Whale Lake and Sawmill Creek	4,138
Horsethief Peak	2,722
Willow Park	887
North of Long Lake	1,221
South of Long Lake	1,473
West of Fishhook Lake	2,052
West of Willow Park	449
Total	12,942

In addition to the areas surveyed many more acres were scouted. On the above survey, 64 full attacks and 50 partial attacks were found. Most of these attacks were weak with poorly developed beetle populations. Since this was one of the heavier woodpecker and parasite areas, it is expected that the beetles will be eliminated from these remaining scattered trees. All of the 1951-attacks with any appreciable beetles left in them were treated in 1952. However, the few beetles left in 1951-attacked trees inaccessible to treating

crews or too scattered to be treated may produce some epidemic groups in 1953. After the 1953 flight several areas should be checked carefully and the entire area should be scouted. Areas needing close attention are:

1. Horsethief Peak around the head of Mad Creek.
2. The head of Soda Creek.
3. The head of Walton Creek.

In addition, trap trees might be felled before the 1953 beetle flight in any of these three areas. It is possible that groups of 1953-attacks may appear and need treatment. Generally, the entire Rabbit Ears block is endemic.

#### Block 6—Surprise Lake

This block was surveyed during 1951 and an epidemic area of about 1,000 acres was found. Scouting in 1952 revealed that the 1951-attacks had been eliminated by woodpeckers and parasites. Practically no 1952-attacks were found. An endemic situation exists in the entire block and surrounding spruce type. General scouting will be necessary after the 1953 flight.

#### Block 7—Meadow Creek

This block was included in the Eagle area during previous years. In 1952 a road was built into the area from the Kremmling area and treating was done by Kremmling treating crews. All 1951- and 1952-attacked trees were treated in the infested block. Scouting of surrounding spruce type revealed no additional epidemic groups.

General scouting of the area will be necessary during 1953 after the flight has occurred. This area is on the White River National Forest.

#### Scouting

A large portion of the spruce type on the Routt and Arapaho National Forests was scouted during 1952. No epidemic areas were found. However, in several places a few trees were found, either scattered or in small groups. No treating is proposed in any of these areas, but each should be scouted after the 1953 flight to determine whether the infestations continue to decrease. Areas needing special scouting are:

- A. Routt National Forest
  1. Mad Creek west of Lake Margaret
  2. South Fork of the Elk River
  3. The head of Gold Creek
  4. The head of Lost Dog Creek
- B. Arapaho National Forest
  1. The head of Keyser Creek
  2. The head of Willow Creek

Some spruce type south of Black Lake was scouted from the Eagle control area. Spots needing observation there in 1953 will be discussed under the Eagle control area.

The endemic situation on the Roosevelt National Forest and in the Rocky Mountain National Park has been dealt with in separate reports to the agencies concerned.

## Eagle Control Area

### Summary

The Engelmann spruce beetle outbreak in the Eagle control area has been greatly reduced during 1952; this reduction in beetle populations is mainly attributable to the three factors previously mentioned. In this control area, the larger 1950 epidemic areas were again surveyed. The small scattered areas surveyed in 1951 were found to be mostly endemic and only scouting was necessary. All of the neighboring spruce type on the White River National Forest was scouted.

The blocks in which concentrations of 1952-attacks occurred were treated. All remaining spruce type in the area contains only scattered infested trees in which beetle populations are light. Parasitism and woodpecker feeding were generally heavy in these areas. Parasitism was so heavy in the Eagle control area that many planned treating blocks were eventually eliminated because of that factor alone. There are some trees which necessarily may be treated in the Eagle control area during 1953, trap trees and trees felled during road clearing in 1952. Those trees will be attacked during the 1953 flight. Also, in the fall of 1953 some trap trees may need to be felled and possibly some 1953 epidemic groups may need to be treated.

The 1952 survey results are summarized in Table 7.

TABLE 7.—Eagle Area—Summary of survey in all blocks (includes blocks where the 1952-attacks were treated).

Block	Acreage Surveyed	Full Attacks Per Acre	Partial Attacks Per Acre	Total Attacks Per Acre	Percent Survey
Red and White Mtn. <sup>1/</sup>	1,424	3.539	1.011	4.551	2.50
Basalt Mtn.	192	0.208	0.208	0.416	2.50
Red Table Mtn. <sup>2/</sup>	10,736	1.714	1.308	3.022	2.50

<sup>1/</sup> All of heavily infested area treated in 1952.

<sup>2/</sup> All of heavily infested areas with severe attacks treated in 1952. Some areas with weakly attacked trees not treated since the attacks do not constitute a threat.

Of the 125,000 1951-infested trees estimated in need of treatment in 1952, the portion of the number treated cannot be reported since many 1950-bases were treated in early summer. The total of both 1950- and 1951-attacked trees treated was 128,699. A larger portion of the trees was treated on the Eagle control area than on the Kremmling area because of less woodpecker work. The acreage surveyed in the above blocks was less than in previous years due to the reduction in the epidemic area. The remaining acreages were scouted thoroughly.

## Descriptions of the Infestation by Blocks

### Block 8—Red and White Mountain

A 2.50-percent survey was made on 1,424 acres of spruce type on Red and White Mountain. Nearly all of the 1951- and 1952-attacked trees containing beetles were treated during 1952. One 70-acre block with a number of weak 1952-attacks was not treated. This block lies east of the South Fork of Piney Creek. Careful checking in the area revealed that parasitism was very heavy and the small populations present did not constitute a threat. The area must be carefully checked in 1953.

About one mile west of Red and White Mountain an area with a number of scattered 1951-attacks was found. Eighteen trap trees were felled in the area to absorb the 1953 flight. These trees will have to be checked and treated after the 1953 flight.

The entire Red and White Mountain area should be scouted after the 1953 flight. The possibility that treating will be necessary is not very great other than the trap trees already mentioned.

### Block 9—Red Table Mountain

A 2.50-percent survey was made on 10,736 acres of spruce type on Red Table Mountain. In addition, many acres of green spruce to the east were scouted intensively. A large portion of the surveyed acreage was treated after the epidemic areas were delineated. All of the areas needing it were treated before the end of the control project. Some areas with numerous attacked trees were not treated because of the extremely weak nature of the attacks and the heavy parasitism. No treating is recommended for standing trees in 1953. Table 8 shows a breakdown of the 1952 survey on Red Table Mountain.

TABLE 8.—Survey of Red Table Mountain by areas. All epidemic areas treated - 1952

Area Included	Acreage Surveyed	Full Attacks Per Acre	Partial Attacks Per Acre	Total Attacks Per Acre
Sundel, Cherry, Erickson Creeks	1,064	0.301	0.376	0.677
Head of North Fork of Cattle Creek	128	5.313	3.125	8.438
Taylor Creek	184	0.435	0	0.435
Erickson, Sourdough, White Creeks	2,288	1.818	1.084	2.902
Sourdough, Swamp, Taylor, Otto, and Downey Creeks	2,264	4.558	3.781	8.339
Jakeman, Ruedi, Frenchman Creeks	3,308	0.544	0.399	0.943
Red Creek Camp	1,500	0.693	0.587	1.280



After the flight in 1953 many felled trees will have to be treated. New roads were built through spruce stands and in the process many spruce trees were pushed over. These trees will absorb much of the 1953 flight and will require treatment. Also, it probably will be necessary to fell some trap trees in the fall of 1953 to absorb the 1954 beetle flight. The necessity and numbers can only be determined after careful checking next fall.

Some of the areas on Red Table Mountain will probably need to be surveyed in 1953. All of Red Table will need to be intensively scouted.

#### Block 10—Basalt Mountain

A 2.50-percent survey was made on 192 acres of Basalt Mountain. The rest of the spruce type was thoroughly scouted. A few scattered infested windfalls were found. All were lightly attacked and constitute no threat of a continued infestation.

Only a general scouting after the 1953 flight will be needed.

#### Scouting

The greater portion of the spruce type on the White River National Forest was scouted during 1952. In addition, a portion of the Arapaho National Forest was scouted by Eagle area crews. This included the area south of Black Lake and west of the Blue River. No epidemic areas were found. Several susceptible areas, the result of snow-slides and windfalls, will need to be carefully checked during 1953.

Several of the blocks surveyed in 1951 required only scouting during 1952. These were:

1. Hardscrabble Mountain
2. Stone Creek
3. Beaver Lake
4. West Lake - East Lake
5. Squaw Creek
6. Triangle Park
7. East Brush Creek
8. Mount Eve

The situation in each of these blocks was found to be endemic. No treating will be necessary in 1953 although several areas should be carefully checked, and the entire acreage should be generally scouted. These areas needing special attention are:

1. South of Fulford along East Brush Creek
2. In the vicinity of Barida Cabins
3. Southeast of Yoaman Park
4. Mount Eve
5. Head of Piney Creek
6. Head of Red Sandstone Creek
7. Head of Middle Creek
8. Head of Timber Creek
9. Tate's logging operation on Hornsilver Mountain
10. South of Homestake Lake

General scouting should be done over most of the spruce type. No control work is anticipated in any of the areas scouted during 1952.

### Summary

During 1952 about 2.4 million gross acres of land were scouted and surveyed for Engelmann spruce beetle infestations.

As a result of control work in 1952 and during previous years together with the buildup of natural control factors, the spruce beetle outbreak is at an endemic level over practically all of the area. The work during the coming year will be very important since it will be a clean-up of the small scattered groups which could build up to an epidemic level.

The Kremmling control area contains no 1952 standing trees which will need treating in 1953. Trap trees will be needed in the fall of 1953 to absorb the 1954 flight which will fly from the scattered 1952-attacks. Scattered trees in the area could build the infestation to epidemic proportions once more although this is doubtful because of the tremendous numbers of parasites and predators in the area.

The Eagle control area contains no 1952-attacked standing trees needing treatment in 1953. On Red and White Mountain and on Red Table Mountain there are many down trees which will absorb 1953 beetle flights and will have to be treated in 1953. Also, trap trees may be needed on Red Table Mountain in the fall of 1953 to absorb the 1954 flight. Here, also, the epidemic could build up although parasites and predators make that possibility quite remote.

A control program in 1953 must be prepared to treat trap trees already down, cut additional trap trees, and treat possibly 25,000 standing trees which might be infested by the 1953 flight of beetles from scattered untreated 1951-trees. This figure is based on the 1951 estimates of 225,000 1951-attacked trees, a treating program which treated about 150,000 of them and the reduced beetle populations in the remaining 75,000. Actually, 25,000 is much higher than expected, but a maximum possible number to be anticipated.

## References

- (1) WYGANT, N. D.  
October 31, 1944. ENGELMANN SPRUCE BEETLE OUTBREAK IN WESTERN COLORADO. Unpublished report. U.S.D.A. Forest Insect Laboratory, Fort Collins, Colorado.
- (2) WYGANT, N. D.  
October 20, 1942. EXAMINATION OF INSECT CONDITIONS ON THE WHITE RIVER NATIONAL FOREST. Unpublished memorandum. U.S.D.A. Forest Insect Laboratory, Fort Collins, Colorado.
- (3) \_\_\_\_\_  
October 23, 1943. MEMORANDUM ON ENGELMANN SPRUCE BEETLE INFESTATIONS, WHITE RIVER NATIONAL FOREST. Unpublished memorandum. U.S.D.A. Forest Insect Laboratory, Fort Collins, Colorado.
- (4) STRUBLE, G. R.  
December 20, 1944. THE ENGELMANN SPRUCE BEETLE--A PROGRESS REPORT OF 1944 STUDIES ON THE GRAND MESA NATIONAL FOREST, COLORADO. Unpublished report. U.S.D.A. Forest Insect Laboratory, Fort Collins, Colorado.
- (5) MASSEY, C. L.  
March 12, 1945. ENGELMANN SPRUCE BEETLE STUDIES, SEASON OF 1944, WHITE RIVER NATIONAL FOREST. Unpublished report. U.S.D.A. Forest Insect Laboratory, Fort Collins, Colorado.
- (6) TERRELL, T. T.  
October 4, 1944. LOSSES CAUSED BY ENGELMANN SPRUCE BEETLE, WHITE RIVER NATIONAL FOREST, 1940-1944. Unpublished memorandum. U.S.D.A. Forest Insect Laboratory, Fort Collins, Colorado.
- (7) \_\_\_\_\_  
October 23, 1944. ENGELMANN SPRUCE BEETLE AND BLACK HILLS BEETLE INFESTATIONS ON THE HOLY CROSS NATIONAL FOREST, SEPTEMBER 1944. Unpublished memorandum. U.S.D.A. Forest Insect Laboratory, Fort Collins, Colorado.
- (8) \_\_\_\_\_  
October 30, 1944. INSECT INFESTATIONS, ROUTT NATIONAL FOREST, ENGELMANN SPRUCE BEETLE--BLACK HILLS BEETLE, OCTOBER 1944. Unpublished memorandum. U.S.D.A. Forest Insect Laboratory, Fort Collins, Colorado.
- (9) \_\_\_\_\_  
January 27, 1945. ENGELMANN SPRUCE BEETLE INFESTATION, WHITE RIVER NATIONAL FOREST, 1944. Unpublished report. U.S.D.A. Forest Insect Laboratory, Fort Collins, Colorado.
- (10) \_\_\_\_\_  
June 27, 1946. INFESTATIONS OF THE ENGELMANN SPRUCE BEETLE IN WESTERN COLORADO. Unpublished report. U.S.D.A. Forest Insect Laboratory, Fort Collins, Colorado.

- (11) TERRELL, T. T.  
October 22, 1945. PRELIMINARY REPORT OF INSECT INFESTATIONS ON AREAS IN REGION 2, SURVEYED JULY 2 TO OCTOBER 9, 1945. Unpublished report. U.S.D.A. Forest Insect Laboratory, Fort Collins, Colorado.
- (12) \_\_\_\_\_  
April 16, 1947. ENGELMANN SPRUCE BEETLE INFESTATIONS ON THE NATIONAL FORESTS OF THE WESTERN SLOPE OF COLORADO, 1946. Unpublished report. U.S.D.A. Forest Insect Laboratory, Fort Collins, Colorado.
- (13) GINTER, P. L.  
ENGELMANN SPRUCE BEETLE INFESTATION ON THE NATIONAL FORESTS OF THE WESTERN SLOPE OF COLORADO, 1947. Unpublished report. U.S.D.A. Forest Service, Denver, Colorado.
- (14) McCAMBRIDGE, W. F.  
February 11, 1949. ENGELMANN SPRUCE BEETLE INFESTATIONS ON THE NATIONAL FORESTS OF THE WESTERN SLOPE OF COLORADO, 1948. Unpublished report. U.S.D.A. Forest Insect Laboratory, Fort Collins, Colorado.
- (15) \_\_\_\_\_, and MERKEL, E. P.  
November 15, 1949. ENGELMANN SPRUCE BEETLE OUTBREAK ON THE NATIONAL FORESTS OF THE WESTERN SLOPE OF COLORADO. Unpublished report. U.S.D.A. Forest Insect Laboratory, Fort Collins, Colorado.
- (16) McCAMBRIDGE, W. F.  
May 1950. ANALYSIS OF THE ENGELMANN SPRUCE BEETLE SURVEY OF 1949 WITH REFERENCE TO CONTROL. Unpublished report. U.S.D.A. Forest Insect Laboratory, Fort Collins, Colorado.
- (17) \_\_\_\_\_  
November 15, 1950. ENGELMANN SPRUCE BEETLE OUTBREAK ON THE NATIONAL FORESTS OF THE WESTERN SLOPE OF COLORADO, 1950. Unpublished report. U.S.D.A. Forest Insect Laboratory, Fort Collins, Colorado.
- (18) \_\_\_\_\_  
July 23, 1951. ENGELMANN SPRUCE BEETLE MORTALITY DUE TO COLD TEMPERATURES AND WOODPECKER FEEDING, 1951. Unpublished memorandum. U.S.D.A. Forest Insect Laboratory, Fort Collins, Colorado.
- (19) \_\_\_\_\_  
December 7, 1951. ENGELMANN SPRUCE BEETLE SURVEY, ROUTT, ARAPAHO, AND WHITE RIVER NATIONAL FORESTS, COLORADO, 1951. Unpublished report. U.S.D.A. Forest Insect Laboratory, Fort Collins, Colorado.
- (20) MASSEY, C. L.  
TRAP LOG STUDIES, ROUTT NATIONAL FOREST, 1949. Unpublished report on Line Project I-c-1-8. U.S.D.A. Forest Insect Laboratory, Fort Collins, Colorado.

- (21) 1950. ENGELMANN SPRUCE BARK BEETLE CONTROL PROJECT, COLORADO, 1950. Unpublished report. U.S.D.A. Forest Service and Bureau of Entomology and Plant Quarantine, Denver, Colorado.
- (22) 1951. ENGELMANN SPRUCE BARK BEETLE CONTROL PROJECT, COLORADO, 1951. Unpublished report. U.S.D.A. Forest Service and Bureau of Entomology and Plant Quarantine, Denver, Colorado.
- (23) 1951. TO SAVE THE TREES BEYOND, revised October 31, 1951. Unpublished report. U.S.D.A. Forest Service, Denver, Colorado.
- (24) 1952. SAVING THE TREES BEYOND. Unpublished report. U.S.D.A. Forest Service, Denver, Colorado.
- (25) KNIGHT, F. B.  
October 3, 1952. ENGELMANN SPRUCE BEETLE CONDITIONS, ROCKY MOUNTAIN NATIONAL PARK, COLORADO, 1952. Unpublished report. U.S.D.A. Forest Insect Laboratory, Fort Collins, Colorado.
- (26) ~~November 12~~, 1952. ENGELMANN SPRUCE BEETLE CONDITIONS, ROOSEVELT NATIONAL FOREST, 1952. Unpublished report. U.S.D.A. Forest Insect Laboratory, Fort Collins, Colorado.